A Section 508–conformant HTML version of this article is available at https://doi.org/10.1289/EHP3762.

Drilling into Critical Windows of Exposure: Trimester-Specific Associations between Gas Development and Preterm Birth

Lindsey Konkel

https://doi.org/10.1289/EHP3762

Several studies suggest that living near unconventional gas development during pregnancy may contribute to poor birth outcomes, including low birth weight,[1,2] prematurity,[3,4] and some birth defects.[5] The emissions and activities related to unconventional gas wells (i.e., those that use hydraulic fracturing to release gas from shale rock) vary at each phase of the site's life. A new proximity study reported in *Environmental Health Perspectives* takes a first look at phase- and trimester-specific associations between unconventional gas activity and preterm birth.[6]

"[Unconventional gas] activity is a proxy for a multitude of exposures," says lead study author Kristina Whitworth, an epidemiologist at UTHealth School of Public Health in San Antonio, Texas. These exposures could include chemical stressors, such as potential endocrine disrupters used in fracking fluid[7] and air emissions from vehicle exhaust,[8] or nonchemical stressors such as noise and light pollution.[9] Anxiety and fear are additional nonchemical stressors for people who are worried about fracking's potential impacts on health or the environment.[10]

"A primary challenge in this research area is moving beyond proximity-based metrics to individual measurements of exposure," Whitworth says. That type of data is costly and time-consuming to collect, she adds, but it will be key to understanding and preventing any health risks posed by unconventional gas development.

Whitworth and colleagues obtained birth records from the Texas Department of State Health Services on all singleton births in the 24-county Barnett Shale region between 2010 and 2012. The study included 13,332 preterm birth cases—defined as birth before 37 weeks' gestation—and 66,933 term births.

The researchers estimated unconventional gas development activity within a half-mile radius of each mother's residence at the time she gave birth. They differentiated between wells that were still being drilled and those that were already producing gas. Then, they identified when those activities took place during pregnancy. If a well was in either phase in any trimester, it was classified as active.

Activities and emissions vary by the phase of well development. During the drilling phase, for instance, heavy diesel-powered equipment is used to drill the well, and large volumes of fracking fluids are injected underground at high pressure. The drilling phase is a relatively short period of intense activity that may involve exposures not only to spilled hydraulic fracturing chemicals but also air pollutants, including benzene and polycyclic aromatic hydrocarbons.[11]

Different phases of well development involve the potential for different exposures among the people living, working, or attending school near a rig. Image: © Topher Donohue/Getty Images.

After drilling, the production phase begins. During this phase, which can last for years, natural gas and wastewater flows from the well. Production-related exposures may involve leaks of wastewater that is stored on the site.[11]

In the current study,[6] women living near the most drilling and production activity had an estimated 20% and 15% (respectively) higher risk of preterm birth, compared with women with no drilling activity near their homes. In their statistical analysis, the researchers controlled for other factors that could affect preterm birth, including the mother's education level and prepregnancy weight, whether she smoked during pregnancy, and the number and timing of her prenatal health-care visits.[6]

The researchers observed the greatest proximity-related risk for extremely premature births, meaning those before 28 weeks' gestation. Women who lived near the densest drilling and production activity were 100% and 53% (respectively) more likely to have extremely premature babies, compared with women who did not live near a well. The authors found only limited evidence of trimester-specific differences in estimated risks.[6]

Preterm babies are at risk of developmental delays and disabilities, asthma, and vision and hearing problems.[12] Future studies could focus on interpreting the clinical relevance of the current findings for later-life health outcomes, suggests Bruce Pitt, a professor of environmental and occupational health at the University of Pittsburgh. Pitt was not involved in the research.

The new study adds to the evidence that fracking may present some risk to fetal health. However, fracking is just one part of well development. The specific exposure or combination of exposures that could be driving the association between unconventional gas development and prematurity remains unclear; fracking itself may pose less risk than other elements of well activity.

Lindsey Konkel is a New Jersey–based journalist who reports on science, health, and the environment.

References

1. Stacy SL, Brink LL, Larkin JC, Sadovsky Y, Goldstein BD, Pitt BR, et al. 2015. Perinatal outcomes and unconventional natural gas operations in Southwest Pennsylvania. PLoS One 10(6):e0126425, PMID: 26039051, https://doi.org/10.1371/journal.pone.0126425.
2. Currie J, Greenstone M, Meckel K. 2017. Hydraulic fracturing and infant health: new evidence from Pennsylvania. Sci Adv 3(12):e1603021, PMID: 29242825, https://doi.org/10.1126/sciadv.1603021.
3. Whitworth KW, Marshall AK, Symanski E. 2017. Maternal residential proximity to unconventional gas development and perinatal outcomes among a diverse urban population in Texas. PLoS One 12(7):e0180966, PMID: 28732016, https://doi.org/10.1371/journal.pone.0180966.
4. Casey JA, Savitz DA, Rasmussen SG, Ogburn EL, Pollak J, Mercer DG, et al. 2016. Unconventional natural gas development and birth outcomes in Pennsylvania, USA. Epidemiology 27(2):163–172, PMID: 26426945, https://doi.org/10.1097/EDE.0000000000000387.
5. McKenzie LM, Guo R, Witter RZ, Savitz DA, Newman LS, Adgate JL. 2014. Birth outcomes and maternal residential proximity to natural gas development in rural Colorado. Environ Health Perspect 122(4):412–417, PMID: 24474681, https://doi.org/10.1289/ehp.1306722.
6. Whitworth KW, Marshall AK, Symanski E. 2018. Drilling and production activity related to unconventional gas development and severity of preterm birth. Environ Health Perspect 126(3):037006. PMID: 29578659, https://doi.org/10.1289/EHP2622.
7. Kassotis CD, Tillitt DE, Lin C-H, McElroy JA, Nagel SC. 2016. Endocrine-disrupting chemicals and oil and natural gas operations: potential environmental contamination and recommendations to assess complex environmental mixtures. Environ Health Perspect 124(3):256–264, PMID: 26311476, https://doi.org/10.1289/ehp.1409535.
8. Zielinska B, Campbell D, Samburova V. 2014. Impact of emissions from natural gas production facilities on ambient air quality in the Barnett Shale area: a pilot study. J Air Waste Manag Assoc 64(12):1369–1383, PMID: 25562933, https://doi.org/10.1080/10962247.2014.954735.
9. Adgate JL, Goldstein BD, McKenzie LM. 2014. Potential public health hazards, exposures and health effects from unconventional natural gas development. Environ Sci Technol 48(15):8307–8320, PMID: 24564405, https://doi.org/10.1021/es404621d.
10. Sangaramoorthy T, Jamison AM, Boyle MD, Payne-Sturges DC, Sapkota A, Milton DK, et al. 2016. Place-based perceptions of the impacts of fracking along the Marcellus Shale. Soc Sci Med 151:27–37, PMID: 26773295, https://doi.org/10.1016/j.socscimed.2016.01.002.
11. Konkel L. 2016. Salting the earth: the environmental impact of oil and gas wastewater spills. Environ Health Perspect 124(12):A230–A235, PMID: 27905276, https://doi.org/10.1289/ehp.124-A230.
12. March of Dimes. Long-Term Health Effects of Premature Birth. https://www.marchofdimes.org/complications/long-term-health-effects-of-premature-birth.aspx [accessed 12 April 2018].